

ECO-INCLINED FASHION PRODUCTS; EXPRESSING THE GREEN QUALITY THROUGH DESIGN LINES

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ABSTRACT

The purpose of this study was to express the message of eco-fashion through design principles form follows function; by fully utilizing materials, avoiding fabric waste and enhancing collection of clothing using eco-design principles. The final product circulated within the exploration of basic shapes that had eventually lead to a solid form of a fashion product. The product was built according to design criteria that consist of usability, aesthetic and technical input. These criteria are formulated according to the findings of the three research questions in relation to global warming and fashion industry's issue. The literature review indicated the importance of new approaches in eco fashion. Collaboratively, modular system, durability and efficiency are the qualities identified in product design that may be implemented in fashion product. This active self-experiential practical process exercised critical thinking, problem solving, using technology and minor engineering in fashion product. Data were collected in two phases; firstly in justifying the issue and secondly, collecting contextual and visual evidences in relation to the research questions. Methods for collecting data included ethnographic, market research, visualization and user testing. The findings from this study included four main designs that features more than one function for each design, which proved that modular system efficient design and durable material were relevant in the study. The essence of designing in this project is using simple shapes that lead to sophisticated form.

Keywords: Sustainable, Eco-Design, Eco-Fashion, Innovative

INTRODUCTION

Nowadays, sustainability has become a global issue even in design field. Sass Brown, in her book *Eco Fashion* (2010) said that one of the dominant trends in fashion is the expression of ecological, social and community consciousness. However, creating clothes that bear these values alone were not enough. According to Isaac Mizrahi in an interview with Jay Calderin in his book *Form Fit Fashion* (2009), any changes should come naturally in the design, as part of the organic design process. Hence, adding up a trend that bear prime weight to be rebalanced with aesthetic in a design process would be a challenge in filling the gap between sustainability and fashion. Eco friendly product or eco design is a literal reference for products that are friendly to both environment and human. There are principles behind an eco design product. Based on the requirement set in www.buygreen.com, the product will have to be considered from 4 aspects; environment, human, manufacturing and lifespan. While according to Ken Yeang and Lilian Woo in their book *Dictionary of Eco Design*, one of the six principles governing sustainable design is minimize the resource usage and waste by reused and recycle. In a nutshell, an integrated approach has positive impacts on all aspects, including material, durability, life cycle and humanities.

Eco-fashion products should embrace sustainable values not only from the material, but also from the provocation through visual impacts through innovative form and detailing. In the context of fashion industry, the values of eco-fashion are randomly manifested through the design lines. Hence, the objectives of the initial research were to express the message of eco-fashion through principles form follows function, fully utilizing materials and avoid waste of fabrics and enhancing collection of clothing using eco-design principles. In order to fulfill the objectives, three research questions had been set up to mark the gap of the research parameter; firstly, what constitutes an eco-design product; secondly, how significant are aesthetic values engaged in eco-design fashion product; thirdly, how to produce a collection of fashion design that fulfilled the principles/standard required of eco-design product without compromising the aesthetic values whilst serving its purpose as a protective outerwear. This research was strictly confined to outerwear components, design lines in garment under the principles of form follow function; particularly in function while still considering the aesthetics of the product and materials that were only meant to enhance the look. The delimitation of this report consist of time constrains; insufficient time for experiment further on techno fabrics that are not available easily locally; secondly, end users' general perspectives; different personal preferences may lead to ineffectiveness of message deliverance and low level of acceptance upon finished products due lack of exposure and knowledge in innovative fashion products.

LITERATURE REVIEWS

Eco-fashion

There was an awakening vibe in the fashion industry; the eco-fashion. This movement kicked into the industry notably since 1980s, whereby many people had become more concerned about the usage of chemicals in fabrics. In time, the advent of eco-fashion emerged on par with other discipline; hybrid automotive, organic food and biodegradable materials. Later, this movement has emerged into something more sophisticated, which is a wave in lifestyle that eventually becomes a trend. It reflected intelligence and sophistication. In countries such as England, Japan and Australia to be named a few, had started to develop fashion label that enrolled ecologically values in their products that had been well accepted in their respective countries. Ciel, the label by an English fashion designer Sarah Ratty, produced collections made of 80%-90% natural, sustainable, ecological fabrics and even counts ethical and fair trade basis. Even big brands such as Levi's and Nike are considering the matter by using natural fiber based fabrics and fair trade production line. Through it all, the message was delivered through ethical management and production, innovative approaches in garment making, Nano technology treatment on fabrics as well as philosophical expression through the design of the clothes. In Malaysia, eco fashion so far was only manifested through the usage of organic fabrics, natural dyes and Nano technology treated fabrics. Design lines is a powerful element in clothing, hence it could be as effective as the material in manifesting eco fashion collection.

Ecological Design, a Natural Change of Values

Eco design reflects a natural change of values. Growing numbers of designers have started to introduce various creative approaches in pursuing eco-challenge design. As a result, some design qualities had been benchmarking the level of eco-design product such as durability of material, low-energy production, efficient design, multifunctional design, do-it-yourself method and modular system, which were very few to mention. And these qualities often manifested in product and furniture designs. For instance, Eco-recliner by Simon White Design, UK, which uses mono-material without any glues or solvents, was a good example of low energy production furniture. Easy hotel uses the modular system in the construction that allows the rooms to have the flexibility to exist in a variety of shapes and sizes in any location. This contributes to its longer lifespan and ensuring sustainability in the future.

In fashion, there are few relevant examples; such as the transformation of recycled fabric into new attire such as the product Sonic Fabric produced by Alyce Santoo, US based designer, who used woven audiotape as the main yarn. Meanwhile independent USA based designer Mark Liu, introduced a new cutting method that resulted zero waste. American Apparel proved that they are playing the game, as they do not employ underpaid seamstresses working inhumane conditions in the third world. These examples proved that fashion do come into sustainable approaches in design. However, mostly ecological fashion products come in forms of material and process; be it recycled material, natural dyes and even appropriate labor work. The design itself seldom manifests the quality of ecological value in fashion design or products through the elements and principle of design. Sass Brown in her book *Eco Fashion* (2014), emphasized her concerns of an ethical fashion becoming plain, boring and often downright ugly. Thus, an added value to eco fashion should be done. There are certain formulas used in product and furniture design in enhancing the quality of eco-design product. By adding extra value, the potential of the basic idea may be enhanced in order to maximize its strength.

An Alternative Approach

According to Peter Denky in his book, *Green Designed fashion*, sustainability alone may not be able to ensure the product to be viable enough. It will always about the design and the values of the surrounding. Thus, the need to look to any potential solution is crucial in order to become a sustainable society. There are many creative approaches quality in eco-design; modular system, efficient design and durable materials are some of them. Modular is an assembly system that formed from a single shape. Based on the interpretation in *Experimental Eco-Design* book by Brower, Mallory and Ohlman, single modular components can be used in various formats, with the ability to lock and interlock. This shows that it has versatile quality and may be transformed into multiple formations due to its material and creativity of the designer. Efficiency is a quality that uses little energy whether in production, transportation or use. Whilst in form, efficient design applied simplified elements that use less labor and energy in manufacturing stage. However, efficiency also manifested when a design is flexible enough to adapt its surrounding as needed. For instance, Ori.Tami, or multifunctional tatami, is a great example of how design becomes ecological when it can be transformed from a tatami into a modern chaise lounge, regardless its non-sustainable materials. Durability is another issue in sustainable terms. According to Alistair Fuad-Luke in his book *Eco-Design Handbook*, an eco material is suppose to be material that has a minimal impact on the environment but offers high performance for the design. Thus, it could be either a material that has low impact on the environment or a strong, durable material that last and prolong its lifespan.

Future Challenges

As quoted by Sass Brown in her book *Eco Fashion*, just like other social and political statements reflected through commercial art, eco fashion is a reaction to social and ecological conditions. In the meantime, this product could be the alarm trigger for the need of ecological awareness in local society. Apart from embracing the challenge of eco-design, the researcher might be able to contribute another engineering technology concept in fashion design. However, by priming the sustainable features in the design, the researcher might face challenges in fulfilling the market demand should the society is not well trained or aware to understand the consideration of practicing sustainable lifestyle. But again, according to Edwin Datschefski in the *Experimental Eco Design* book by Brower, Mallory and Ohlman, the sustainable future lies in looking for a potential approach to fulfill the market demand in a more constructive manner. Hence, the researcher has narrowed down the market segment by focusing on young adults that may afford the design. This is part of training the society as the youth culture is what that drives trends. Brower, Mallory and Ohlman mention this in *Experimental Eco Design* book that emphasized if sustainability is to become an integral part of culture and design, it must first accept by young people.

Sass Brown mentioned in her book *Eco Fashion*, all actions taken is the little particle in commanding the masses to engage in eco trend. However, all these effort must not compromise aesthetic value, as designer Isaac Mizrahi said in an interview with Jay Calderin in his book *Form Fit Fashion*, that reform or changes has to come as part of beautiful design, as part of an organic design process. It is a nature of design process, whereby designers offer solution to a problem in a beautiful yet acceptable form of product.

PROBLEM STATEMENTS

Eco-fashion products should embrace sustainable values not only from material, but also from the provocation through visual impacts in innovative form and detailing. In Malaysia, eco-fashion has been tackled mostly from the usage of materials and trimmings. The values of eco-fashion are randomly manifested through the design lines. (Saliang, 2013) Innovative products are the ones that acquire innovative elements in which contributed to its potential and quality. Back in 1930s, people started to figure out on how the garment could be innovative as possible. The usage of zippers and utility pockets were widely used in enhancing the clothes. Until today, these additional elements are still relevant in producing innovative fashion product. During International Greentech Exhibition Malaysia in Kuala Lumpur Convention Center in 17th October 2010, it was clear that in Malaysia, the fashion industry only reacted to the usage of textile in terms of going ecological friendly. This further justified that design lines are rarely used in manifesting eco-fashion.

METHODOLOGY

The general flow chart of the overall process is as below.

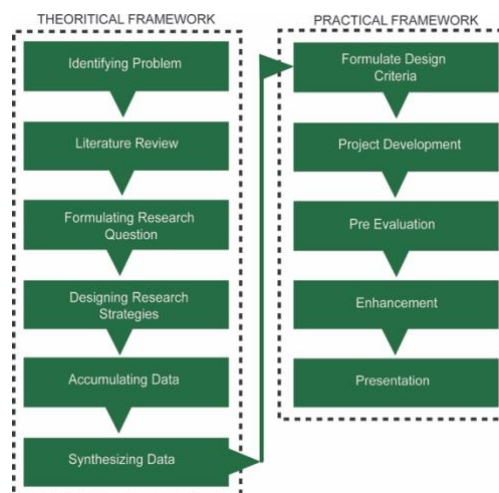


Figure 1: Flow Chart of the Overall Process

The problem is defined by looking at the bigger picture, which was the macro approach of the issue, followed by narrowing down to issue that was related to design area, which is the micro approach of the issue. Global warming was seen as the big picture, which grabbed much attention from various field, including design. The researcher explored the substantial issues that circulate within the parameter of the core issue using mind mapping by answering the how, why, who, when, which and what factors.

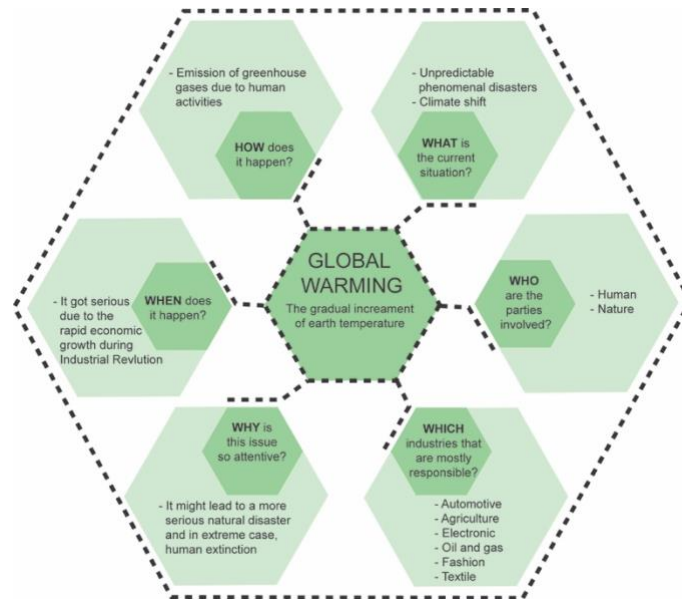


Figure 2: Simplified Mind Map of the Global Warming Factors

By relating the findings in macro with issues that are related to design, the researcher then found the gap between the fashion industry and global warming issues. To



Figure 3: Micro Mind Map in Relation to Fashion Industry in Global Warming Issue

To further justify the issue, written and visual evidences were acquired and evaluated through qualitative method. In depth, relevant and critical design related issues were relatively appraised regarding design solution approach in ecological design terms. This was to review on how other design related fields such as product design solve problems towards innovative products. The findings were then listed systematically and then compared with the fashion design approach. Visual evidences were accumulated and sectioned accordingly. By subjecting visual evidences to relevant literal evidences, it was easier for researcher to visualize further regarding measures that have been taken and need to be taken in filling the gap found in the issue. After reviewing literal and visual evidences, research questions that were expected to be able to personify solutions for the gap in the issue are proposed. These research questions will be answered through research strategies. These research strategies were based on the Jennifer Visockey O'Grady and Kenneth Visockey O'Grady models in their book, *A Designer's Research Manual* (page 16-58).

Table 1: Research Questions and Strategies

Research Question	Research Design	Justification
1. What constitute an eco-friendly fashion product?	Contextual Review	This question was a fundamental research. The researcher acquired the information through secondary resources such as books and journals.
2. How significant is aesthetic value engaging in eco-friendly fashion product?	Contextual Review Ethnography Emic: photo ethnography Etic: observational and photo ethnography	Sass Brown in her book Eco Fashion mentioned that eco product was always appeared boring and ugly. Thus the researcher would like to find out how important it is to produce beautiful eco fashion product.
3. How to produce a collection of fashion design that fulfilled the principles/ standard requirement of eco-friendly product without compromising the aesthetic value?	Market Research Demographic Psychographic Visual Exploration Visualization Color Theory User Testing Iterative Design Persona	Market Research Demographic Psychographic Visual Exploration Visualization Color Theory User Testing Iterative Design Persona

Based on the analysis acquired from the first two questions, the researcher formulated the design criteria consisting of specified weightage; usability 40%, aesthetic 40% and technical 20%. Generally, the prototype would have to meet a certain expectation of usability and aesthetics whilst the technical aspect would be of secondary priority. This is the specification defined in relation to research question 3. The design criteria are as below.

Table 2: Design Criteria

Criteria	Cluster(s)	Semi cluster(s)	Variable
Usability (40%)	Personifications of users	Does it meet the demographic profile of the target group?	Target group
		Does it meet the general preferences of the target group?	Target group
	Versatility of usage	Does it offer more than 3 functions?	Function 1
			Function 2
			Function 3
		Is it friendly enough to be used?	Function 1
			Function 2
			Function 3
Aesthetic (40%)	Manifestation of design principle	20/80 rule	Form of the design
		Form follows function	Shape of the design
		Aesthetic driven	Ensemble design
	Novel concept	New Look	Design handling
		Avant Garde	Design and environment
		Green design	The overall usage
	Visual Enhancement	Colors on emotion	Color psychology
		Ratio of the design towards users	Visual balance
Technical (20%)	Material	Appropriateness; does it contribute to the design?	Form and function of the design
		Durability; is the material durable enough for the usages?	Form and function of the design
	Jointing and fastening	Friendly user; is it easy to use?	Form and function of the design
		Durability; is the placement suitable enough?	Form and function of the design

Using the design criteria as basic guideline, a process of project development resulted the final product as a respond to the aim and objective of the whole research. Below is the chart of design selection process.

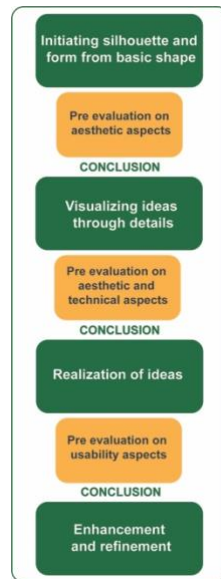


Figure 4: Design Process of the Project Development

The outcomes of the design process in the project development is elaborated in the following paragraph.

RESULTS & DISCUSSION

Firstly, research question 1 was answered through contextual review. Eco friendly product or eco design is a literal reference for products that are friendly to both environment and human. There are principles behind an eco design product. Based on the requirement set in www.buygreen.com, the product will have to be considered from 4 aspects; environment, human, manufacturing and lifespan. While according to Ken Yeang and Lilian Woo in their book *Dictionary of Eco Design*, one of the six principles governing sustainable design is to minimize the resource usage and waste by reusing and recycling. In a nutshell, an integrated approach has positive impacts on all aspects, including material, durability, life cycle and humanities. Secondly, research question 2 was answered through contextual review and ethnography method. Innovative products are the ones that acquire innovative elements, which contributed to its potential and quality. Back in 1930s, people had already started to figure out on how the garment could be innovative as possible. The usage of zippers and utility pockets were widely used in enhancing the clothes. Until today, these additional elements are still relevant in producing innovative fashion products. Therefore, using the design criteria's that were formulated based on the findings of the first two question, the researcher finally come out with products that are constructed based on a simple geometric shape as the garment pattern, as they are easy to be arranged on the layout. The project development started with initiating silhouette and form using basic shapes. Through the researcher's seven years experience in fashion design, design line in a garment should come from an object (subject matter) or inspiration of a culture, surroundings or even costume. Through 2D stylization phase, design lines were derived and eventually became a new design. However, this understanding had become a hindrance for the researcher to come up with innovative design that speaks philosophically. Thus, the researcher decided to use a collage technique to break the ice of the former understanding in design process. By using rectangle shape and random slashes, the researcher explored the possible placement of the shape on a hand drawn flat drawing. The results were rather unpredictable and surprising. New silhouettes were produced through 12 attempts of collage techniques.

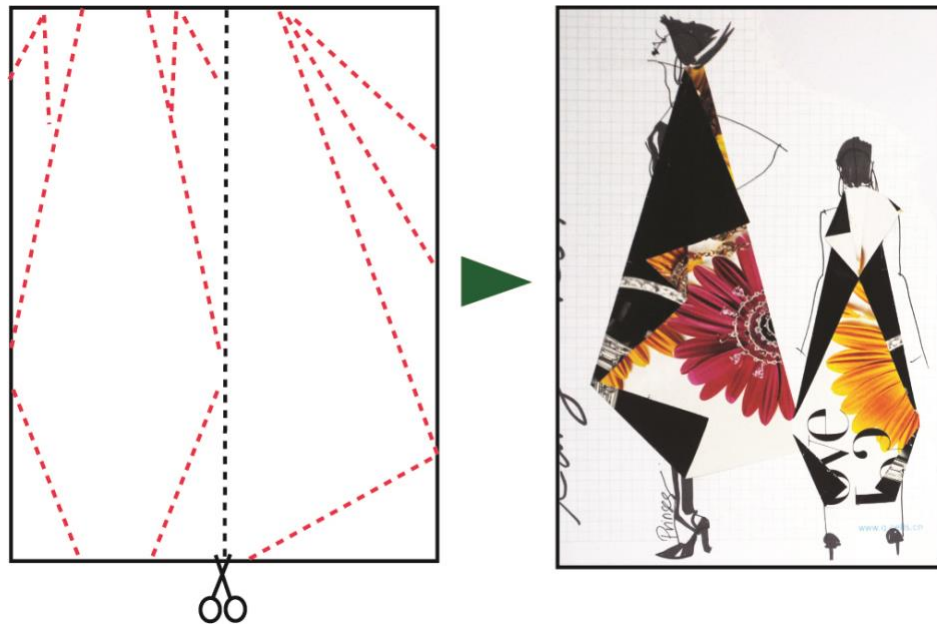


Figure 5: Example of Two Piece Collage Technique

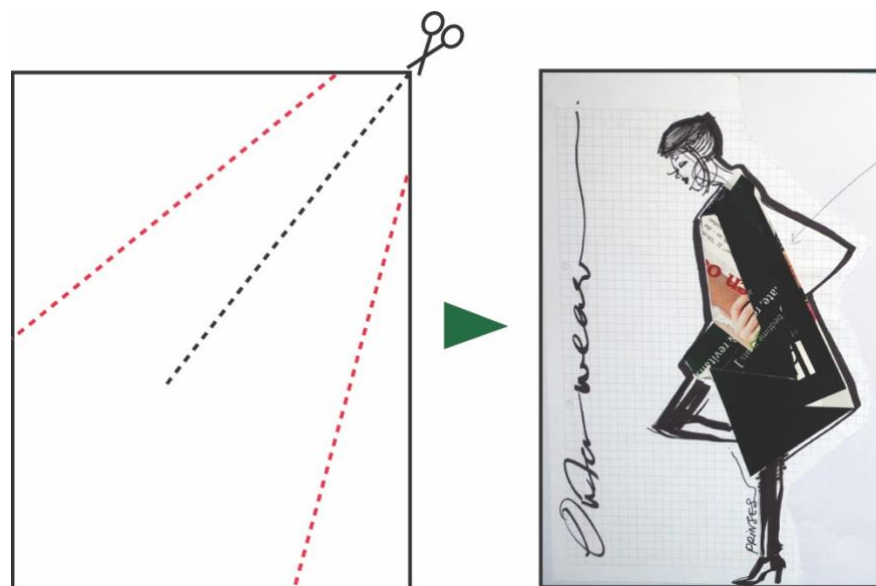


Figure 6: Example of One Piece Collage Technique

The experiment tailed to the next level; using 3D approach, which is modeling in experimenting the potential of the basic shape and simple cutting. The researcher used two types of fabrics for the experiment; knitted pin ribbed cotton and calico.



Figure 7: Example of modeling technique using knitted pin ribbed cotton

First Pre Evaluation: Aesthetic Aspects

First stage of pre evaluation was based on the aesthetic components. The researcher evaluated all the ideas using the aesthetic cluster in design criteria. Some of the ideas were evaluated individually whilst some in grouping, which is according to their similarities. The researcher took positivism measure in the first pre evaluation to look for more potential fresh ideas.

Visualizing Ideas Through Details

After analyzing the finding in the first pre evaluation, the researcher developed more designs by experiment the form and silhouette on the dress form. This involved more technical knowledge. The ideas were refined in volume, ratio, opening and fabrics. The designs were more controlled in the sense of overall look and construct wise. The process was random in terms of approaches; the researcher used sketching and modeling substantially.

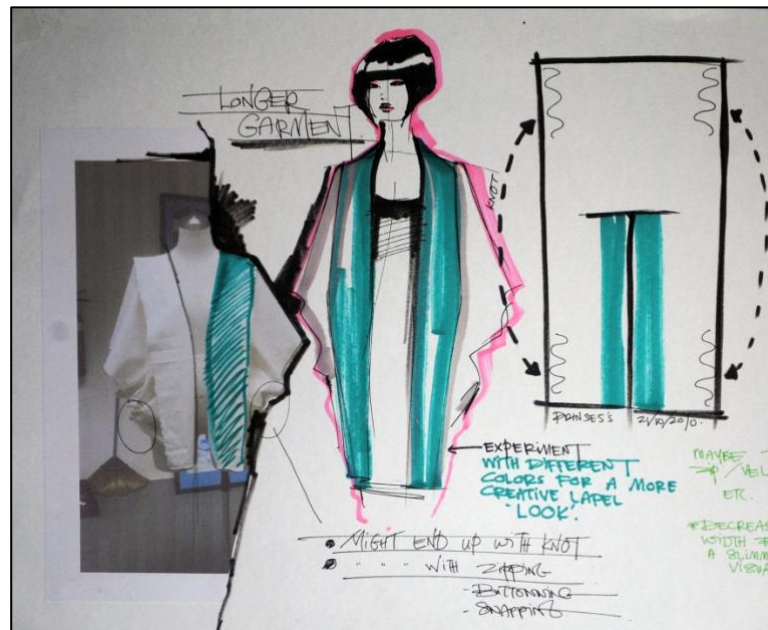


Figure 8: Example of Visualizing Ideas Through Details such as Collar

Second Pre Evaluation: Aesthetic and Technical Aspects

Second pre evaluation was based on the aesthetic and technical clusters in design criteria. All new ideas were evaluated, some individually and some in groups according to similarities. The researcher still retained positivism measure as to screen on the potential design. 6 ideas of the highest points were brought front to be further evaluated qualitatively. Only 1 of the 6 ideas, which is in design sequence 103, was to be developed in the next stage.

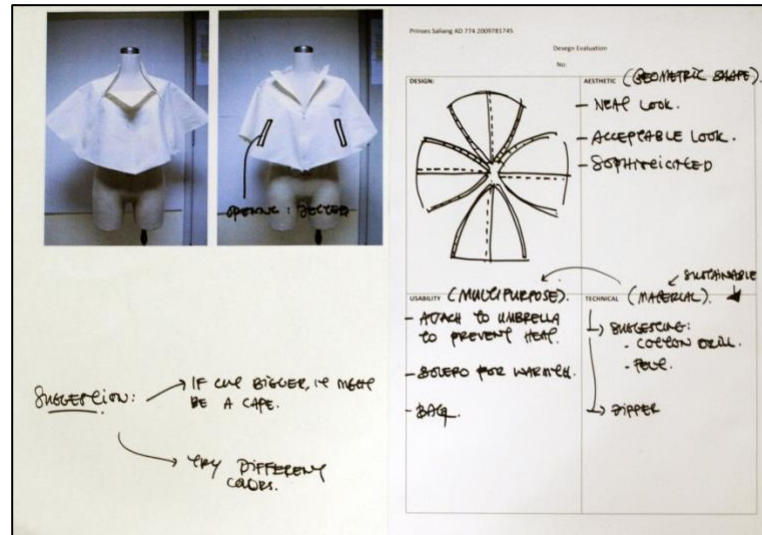


Figure 9: Selected Idea for Next Stages

Realization of Ideas

The final idea that was selected in second pre evaluation was in circular shape. From this basic shape, the researcher analyzed the possible breakdown of the design. From the analysis, the researcher started to construct the product. All the process involved was quite basic. The construction of each panel was the same to one another. However the treatment of each fabric differs from one another.

Third Pre Evaluation: Usability

The third evaluation was based on the usability aspects. This is because the researcher had evaluated the aesthetic and technical aspects respectively in the earlier evaluation. Since usability carries heavy weightage in the design criteria (40%), the researcher chose to evaluate the products' usability individually.

Design Description

The process was more of a research and development through self-experiential method (epistemology). By having experience in fashion design, the researcher used a mixture of various techniques in both producing and polishing ideas. Below are the approaches that had been used along the process.

Collage Technique

This technique is one of the purest forms of design initiation, which has no boundaries in terms of technicality, just yet. It gave freedom to the researcher to initiate a silhouette; one of the most crucial element in fashion design process.



Figure 10 : Sample of Collage Techniques

Collage and Sketching Approach

This techniques requires an in depth understanding of pattern making and translating from 2D to 3D. Below is an example of a idea initiation based on 2D and 3D process.

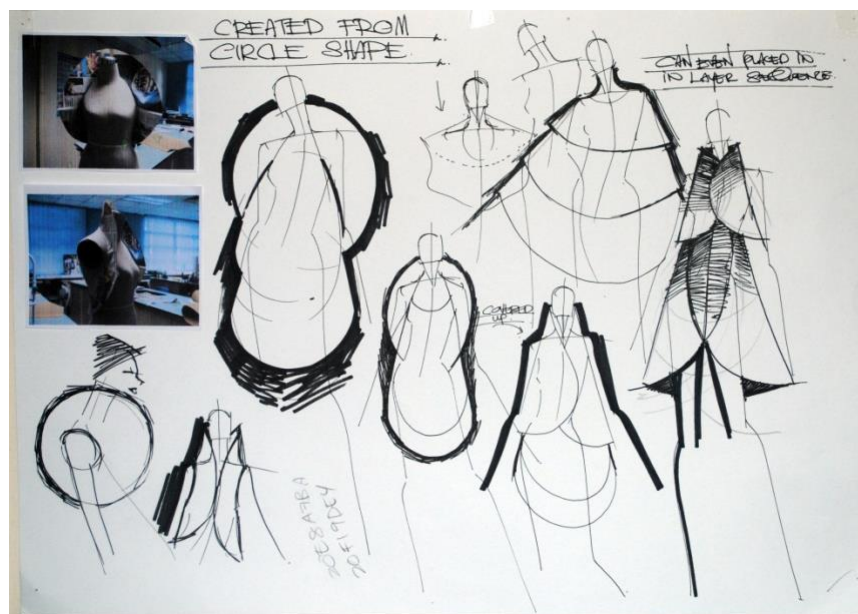


Figure 11: Sample of Sketches

Modeling

Normally, this technique requires a proper dress stand and done based on life scale. Nonetheless, since the initiation of ideas are basically using simple shapes and did not require a complex technical handling, it was done on a 1:20 scale on a miniature dress stand, which worked perfectly.



Figure 12: Modelling on dolls

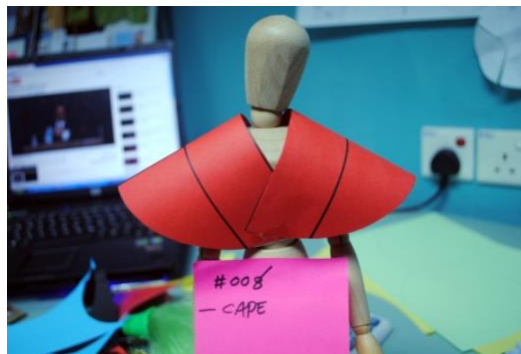


Figure 13: Modeling on dolls

It can be concluded that most of the approaches in preliminary stage were experimental. It is because the researcher did not expect for any specific outcomes when doing sketches, models and collages. However, in visualizing ideas through details, the researcher tried to meet specific outcomes of the ideas. The result was inconsistent; by using knowledge that the researcher has, the results were sometimes meet the predicted outcome whilst sometimes no. In realization idea stage, the process of constructing the panels is basically the same. Below is the flow chart of constructing the panels.

Table 3: Workflow of the sewing operation

#	Operation	Machine/ Foot	Note
1	Fuse the fabric as needed.	Fuser	-
2	Sew zipper at the edge of the triangle.	Single Needle Lockstitch / Zipper Foot	-
3	Attach lining and leave an opening of 5 cm	Single Needle lockstitch	-
4	Turn the panel inside out	-	Hand Operation
5	Press	Press Iron	-
6	Close the opening	-	Hand Stitch
7	Press finish	Press Iron	-

The standard workflow justify the efficient production process of the all the prototype, hence further established the efficient quality of the products. The end products are somehow subjected to to the needs of reducing fabric waste, labor energy and maximize efficiency in production line. The final look might be simple, but it required intellectual level to explore the other possible functions. This was a challenge to the researcher. The result nonetheless, was satisfying despite its simple and basic shape. From a simple pattern, it gives prolific ideas and creates various forms, which serves various functions. This multifunctional value is a key point that serves the environment, whereby the product may be used in several ways.



Figure 14: Design Idea #01



Figure 15: Design Idea #02



Figure 16: Design Idea #03



Figure 17: Design Idea #04

DISCUSSION

From the analysis of the previous chapter, it is justified that outerwear that is made out of a simple pattern could be stylish and flexible. The silhouette appears similar with one another but the color, details and styling gave the garment a fresh look. The flexibility of the pattern, which offers more than one functions, made the product convenient and efficient in terms of usability and packaging. Its classic shape and relevant usability might be the selling point should this garment enters mass production. It is surprising for the researcher, to be able to come up with such much usability out of a simple shape, in this case triangle, as the main shape. Looking back on the first research question, the researcher was looking for something that can be called eco design product. Eco design product can manifest through various angles; be it production, material and even usages. From the usages aspect, the multifunctional usages and durability of the product somehow contributed to the requirement of the product to be called as eco design. The research question 2 circulated within the parameter of aesthetic and innovative design. Looking back on the contextual review, aesthetic can be defined when the product has its function. This is the dogma that had been created since the establishment of the Bauhaus school. Using this fundamental as the benchmark in subjecting beauty, the product hence may be considered as beautiful. Using design criteria that were formulated based on the finding of research question 1 and 2, the researcher managed to create one series of designs that manifested ecological issue. Its ability to be stylized and adapted to new environments proved that the consumers could use it. In conjunction of the objectives of the research, the outcome of the project was actually answering the given objectives. Through multi functional product, the ecological message was conveyed, saying that part of being green is being able to reuse, reduce and recycle. By using simple geometric shape, the layout is efficiently used and this is to avoid much fabric's waste. This is important if the designs are meant for mass production. By using these qualities, the product is perceived as beautiful, a quality that is crucially needed for a viable fashion product. Thus, the researcher believed in the design philosophy that beauty could be derived from form, function and philosophy. In a nutshell, simplicity leads to sophistication.

CONCLUSION

Based on the findings, the researcher stands on the design philosophy simplistic shape leads to sophisticated beauty. In this research, the assemblage of simple shapes will finally lead to creative forms. Due to the constraint of time, the project can only cover the exploration of shapes and forms. Other elements such as fabrics, colors and detailing which meant to be part of the functions to enhance the design are limited to serve this sole purpose. Should this theory will be further tested, future researcher might have to explore the theory from other elements of design such as color, lines and even space. The medium might change from clothing to other various fields such as textile. To enhance the design further, future researcher might have to see from the perspective of technological viable materials such as Goretex and even natural fiber fabrics and advanced making up garment techniques would further enhance the production process. As the saying goes less is more and more is less, the researcher is able to conclude that innovative ideas can come up with a very simple object. This provoked the researcher on how far she can go in exploring new ideas without compromising ecological values as simple as avoiding fabric waste. As a designer that is trained for seven years in fashion field, it is admitted that fashion products are always perceived differently than product design or furniture design when it comes to sustainability or eco-design. Through this project that combined several inputs from the product design philosophy, it is proven that design can manifest in various ways and. The findings have somehow proven that a collection of ecological fashion that embraced ecological values can be produced based on a simple pattern, which is efficient and sustainable.

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